

Version With Markings to Show Changes Made in Specification and Claims

Please amend the specification in the paragraph bridging pages 19 and 20, as follows:

--Photomicrographs of the plug face showed latex accumulation along microfractures in the shale. As the volume and velocity of filtration flow into these cracks is very small, filtration alone cannot account for the latex accumulation at the crack throat. Inside these cracks the clay surface area to filtrate volume ratio is very large resulting in heavy EXP-154 precipitation. The reason may relate to the co-precipitation behavior of EXP-154 and EXP-155 as discussed previous, without being limited to any particular explanation. The precipitation of aluminum complex at pH [<19] ≤ 9 apparently enhances latex accumulation at the crack throat. When sufficient latex is deposited to bridge the crack opening, the fracture is sealed and differential pressure is established across the latex. The differential pressure consolidates the latex deposit into a solid seal. Increasing the differential pressure apparently causes this seal to deform over time (about 30 hours in the case of the FIG. 6 results) and/or grows additional cracks in the shale and the shale begins to leak, although the inventors do not necessarily want to be limited by this explanation. However, additional circulation rapidly sealed the leaks and reestablished the seal. Circulating after the full differential pressure was reached formed a stable seal with only a small pressure rise.--

Please amend claims 1, 3, 8, 10, and 12 as follows:

--1. (Amended) A water-based drilling fluid comprising:

- a) a polymer latex capable of providing a deformable latex film on at least a portion of a subterranean formation; [and]
- b) water ; and
- c) at least one precipitating agent selected from the group consisting of aluminum complexes.--

--3. (Amended) The water-based drilling fluid of claim 1 [further comprising a] where the precipitating agent further comprises a silicate.--

--8. (Amended) A water-based drilling fluid comprising:

- a) a polymer latex;
- b) a precipitating agent selected from the group consisting of aluminum complexes;
- c) a surfactant; and
- b) water.--

--10. (Amended) The water-based drilling fluid of claim 9 where the salt [in the saturated salt brine] is selected from the group consisting of calcium chloride, sodium chloride, potassium chloride, magnesium chloride, calcium bromide, sodium bromide, potassium bromide, calcium nitrate, sodium formate, potassium formate, cesium formate, and mixtures thereof.--

--12. (Amended) The water-based drilling fluid of claim 8 where the precipitating agent [is selected from the group consisting of silicates, aluminum complexes, and mixtures thereof] further comprises a silicate.--

Please cancel claim 13 in favor of claim 39.

Please amend claims 20, 22, 24, 27, and 31 as follows:

--20. (Amended) A method of inhibiting borehole wall invasion when drilling with a water-based drilling fluid in a subterranean formation, the method comprising:

- a) providing a water-based drilling fluid comprising:
 - i) a polymer latex capable of providing a deformable latex seal on at least a portion of a subterranean formation; [and]
 - ii) water; and
 - iii) at least one precipitating agent selected from the group consisting of aluminum complexes; and

- b) circulating the water-based drilling fluid in contact with a borehole wall.--

--22. (Amended) The method of claim 20 where in providing the water-based drilling fluid, the [fluid further comprises a] precipitating agent further comprises a silicate.--

--24. (Amended) A method of inhibiting borehole wall invasion when drilling with a water-based drilling fluid in a subterranean formation, the method comprising:

- a) providing a water-based drilling fluid comprising:
 - i) a polymer latex;
 - ii) a precipitating agent selected from the group consisting of aluminum complexes; and
 - iii) water; and
- b) circulating the water-based drilling fluid in contact with a borehole wall.--

--27. (Amended) A method of inhibiting borehole wall invasion when drilling with a water-based drilling fluid in a subterranean formation, the method comprising:

- a) providing a water-based drilling fluid comprising:
 - i) a polymer latex;
 - ii) a precipitating agent selected from the group consisting of aluminum complexes;
 - iii) a surfactant; and
 - iv) water; and
- b) circulating the water-based drilling fluid in contact with a borehole wall.--

--31. (Amended) The method of claim 27 where in providing the water-based drilling fluid, the precipitating agent [is selected from the group consisting

of silicates, aluminum complexes, and mixtures thereof] further comprises a silicate.--

Please cancel claim 32 in favor of claim 40.

Please amend claim 38 as follows:

--38. (Amended) A method of inhibiting borehole wall invasion when drilling with a water-based drilling fluid in a subterranean formation, the method comprising:

- a) providing a water-based drilling fluid comprising:
 - i) from about 0.1 to about 10 vol.% of a polymer latex selected from the group consisting of polymethyl methacrylate, polyethylene, carboxylated styrene/butadiene copolymer, polyvinylacetate copolymer, polyvinyl acetate/vinyl chloride/ethylene copolymer, polyvinyl acetate/ethylene copolymer, natural latex, polyisoprene, polydimethylsiloxane, and mixtures thereof;
 - ii) from about 0.25 to about 20 lb/bbl of a precipitating agent selected from the group consisting of silicates, aluminum complexes, [ether carboxylates,] and mixtures thereof;
 - iii) at least 1 wt.% of a salt selected from the group consisting of calcium chloride, sodium chloride, potassium chloride, magnesium chloride, calcium bromide, sodium bromide, potassium bromide, calcium nitrate, sodium formate, potassium formate, cesium formate, and mixtures thereof;
 - iv) from about 0.005 to about 2 vol.% of a surfactant selected from the group consisting of betaines, alkali metal alkylene acetates, sultaines, ether carboxylates, and mixtures thereof; and
 - v) water making up the balance,

where the proportions are based on the total water-based drilling fluid; and

- b) circulating the water-based drilling fluid in contact with a borehole wall.--

The claims remaining in the application are 1-12, 14-31 and 33-40.

REMARKS

The Applicants would like to thank the Examiner for the quick and courteous first Office Action. The Applicants greatly appreciate the indication that claim 19 is allowable over the art of record.

The Applicants further appreciate the Examiner's indication that claims 13 and 32 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim. The Examiner's attention is thus respectfully directed to newly submitted claims 39 and 40, which are claims 13 and 32, respectively, so rewritten.

The Applicants would further direct the Examiner's attention to the fact that a typographical error in a pH value in the paragraph bridging pages 19 and 20 has been corrected. The expression "<19" for pH was obviously incorrect since 13 is commonly considered a maximum possible pH value. It is further respectfully submitted that this change was made to correct an inadvertent clerical error and not for any substantial reason related to patentability. The Applicants regret any confusion this inadvertent error may have caused.

35 U.S.C. §112, Second Paragraph, Rejections

The Examiner has rejected claim 10 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicants regard as their invention.

The Examiner finds there is no antecedent basis for "the unsaturated salt brine" in this claim or the parent claims.

The Applicants appreciate the Examiner pointing out this concern. The Examiner's attention is respectfully directed to the amendment to claim 10 herein where the phrase "in the unsaturated salt brine" has been deleted. This phrase was mistakenly included in this claim. It is respectfully submitted that this change renders the rejection moot. It is further respectfully submitted that this change was made to correct an inadver-

tent clerical error and not for any substantial reason related to patentability. The Applicants regret any confusion this inadvertent error may have caused.

Reconsideration is respectfully requested.

35 U.S.C. §112, First Paragraph, Rejections

The Examiner has rejected claim 38 under 35 U.S.C. §112, first paragraph, as allegedly containing subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. The Examiner finds that Applicants' specification fails to teach that ether carboxylates are precipitating agents.

The Applicants appreciate the Examiner pointing out this concern. The Examiner's attention is respectfully directed to the amendment to claim 38 herein where the term "ether carboxylates" has been deleted. This term was mistakenly included in this claim. It is respectfully submitted that this change renders the rejection moot. It is further respectfully submitted that this change was made to correct an inadvertent clerical error and not for any substantial reason related to patentability. The Applicants regret any confusion this inadvertent error may have caused.

Reconsideration is respectfully requested.

Rejection Under 35 U.S.C. §102(b) Over GB 2351986

The Examiner has rejected claims 1-12, 14, 16-18, 20-31, and 33-37 under 35 U.S.C. §102(a or e) as allegedly being anticipated by the GB 2351986.

The Examiner finds that GB 2351986 teaches a drilling fluid, for drilling a well-bore, which comprises a latex, water, a surfactant, salts (page 9) and a silicate or aluminosilicates (clays), which are allegedly the same as the precipitating agent of the present invention. The Examiner further contends that although GB 2351986 does not specifically state that the silicate or clay is a precipitating agent, the mere reason for adding a material to another is not a patentable difference, citing *In re Lintner* and *In re Mod*. Thus,

the Examiner concludes that the present invention is allegedly anticipated by GB 2351986.

The Applicants must respectfully traverse.

A patent claim is anticipated, and therefore invalid, only when a single prior art reference discloses each and every limitation of the claim. *Gilaxo Inc. v. Novopharm Ltd.*, 52 F.3d 1043, 1047, 34 U.S.P.Q.2d 1565 (Fed. Cir.), cert. denied, 116 S.Ct. 516 (1995).

The Examiner's attention is respectfully directed to the amendments to the rejected independent claims herein 1, 8, 20, 24, and 27 where all claims have been amended to include at least one precipitating agent where the precipitating agent is selected from the group consisting of aluminum complexes. Support for these amendments is found in dependent claims 12 and 22 as filed, and thus these changes do not constitute improper insertions of new matter.

It is respectfully submitted that GB 2351986 does not teach or suggest the use of aluminum complexes as precipitating agents, and thus the single prior art reference does not disclose each and every limitation of the claims, as amended. Although the Examiner contends that GB 2351986 mentions clay, the Applicants only find where silicates are mentioned on page 5, line 23. It is again respectfully submitted that GB 2351986 does not teach or suggest the use of aluminum complexes of any sort as precipitating agents, and that clays or aluminosilicates are not taught or suggested therein as having a precipitating ability at all. The Examiner has not noted where *in the reference* precipitating agents or aluminum complexes are mentioned.

There is a very important technical and commercial distinction between the GB 2351986 reference and invention as recited in the amended claims. GB 2351986 is directed to a latex/polymer used to enhance the strength/sealing ability of a filter cake (please see page 3, lines 31-34 and page 7, lines 11-12). A filter cake is formed when, as the name implies, clay solids and reinforcing polymer are filtered out of solution by flow of the drilling fluid into the formation. This is a trivial case application of latex. A wide variety of fibrous materials have been used to reinforce filter cakes over the years, such as asphaltenes, calcium carbonate, cellulose, and other filtration control additives.

The invention as recited in the amended claims solves a very different technical problem, the sealing of very low permeability formations, such as shales, where the flow of fluid into the formation is far too slow to filter out more than a few particles or create any pressure differential to hold particles against the formation if they are deposited.

Without any flow to deposit the polymer or pressure differential to hold the polymer against the formation, the plating of the particles on the formation can only be effected by chemical means. In the claimed invention the aluminum complex precipitates preferentially into the fluid in the shale cracks with little or no flow into the formation. The latex will then plate out of solution onto the aluminum, again with little or no flow into the formation. Since latex has a high affinity for itself, with additional circulation more latex will accumulate on the original deposit and form a latex "ball" or "mass" in the entrance to the crack. The agglomeration substantially seals the crack entrance that allows the very slow movement of pore fluid out of the crack into the formation to establish a pressure differential across the accumulated latex. This pressure differential drives the latex into the crack and fixes the latex in place.

Stated another way, the latex by itself will not adhere to the shale at all or at least to any effective extent. The precipitating agent is believed to be precipitated by a reaction with the shale pore water and forms a "primer coat" roughly similar to a paint primer (to employ a non-limiting analogy). The polymer latex then precipitates out on the "primer coat", and forms a coating analogous to latex paint. The Examiner's attention is respectfully directed to page 6, lines 17-19 of the application as filed that states: "Without being limited to a particular theory, the precipitating agent is believed to chemically bound to the surface of the clay of the borehole and provide a highly active polar surface."

It is respectfully submitted that the Applicants do not wish the claims to be limited by any of the details of the mechanism described in the previous paragraphs. However, an important point is that the aluminum complexes are recited as *precipitating agents* in the amended claims and GB 2351986 does not teach or describe any such precipitating agents. Another non-limiting analogy would be to view the filtration control fibers of GB 2351986 similarly to the straw used to reinforce adobe mud bricks. The GB 2351986 invention is to use polymers in the bricks instead of straw. The instant invention

is a dip, coating or layer that will reinforce the brick when nothing more can be put into the brick. Reconsideration is respectfully requested.

Rejection Under 35 U.S.C. §102(b) Over GB 2131067

The Examiner rejected claims 1-5, 7-9, 11, 12, 14, 15, 20-24, 26, 27, 28, 30, 31, 33, and 34 under 35 U.S.C. §102(b) as allegedly being anticipated by the GB 2131067.

The Examiner finds that GB 2131067 teaches a drilling fluid, for drilling a well-bore, which comprises a latex, water, a surfactant and bentonite which is an aluminosilicate, which are allegedly the same as the precipitating agent of the present invention. The Examiner further contends that although GB 2131067 does not specifically state that the clay is a precipitating agent, the mere reason for adding a material to another is not a patentable difference, again citing *In re Lintner* and *In re Mod*. Thus, the Examiner concludes that the present invention is allegedly anticipated by GB 2131067.

The Applicants must respectfully traverse.

A patent claim is anticipated only when a single prior art reference discloses each and every limitation of the claim. *Glaxo Inc. v. Novopharm Ltd.*, *id.*

The Examiner's attention is again respectfully directed to the amendments to the rejected independent claims herein 1, 8, 20, 24, and 27 where all claims have been amended to include at least one precipitating agent where the precipitating agent is selected from the group consisting of aluminum complexes. It is respectfully submitted that GB 2131067 does not teach or suggest the use of the recited aluminum complexes as precipitating agents, and thus the single prior art reference does not disclose each and every limitation of the claims, as amended.

It is respectfully submitted that the important technical and commercial distinction between the GB 2351986 reference and the invention as recited in the amended claims is also present between the claims and GB 2131067. GB 2131067 relates to the addition of minor proportions of a polymer, which is insoluble in water, to oil-based or water-based drilling fluids to improve the rheological properties of the fluid and/or improve the fluid loss control of the fluid (please Abstract). While the Applicants do not wish the claims to be limited by any of the details of a proposed mechanism described in

the previous argument, an important point is that the *aluminum complexes* are recited as *precipitating agents* and GB 2131067 does not teach or describe any such precipitating agents, either those claimed or others.

In fact, GB 2131067 requires that the polymers in their fluids *must remain dispersed*. The Examiner's attention is respectfully directed to page 2 lines 18-30 therein which recites:

The polymer itself is preferably used in the form of an *aqueous dispersion* and such *dispersions* may be prepared by a variety of conventional procedures. If the polymer is obtained in the form of a fine-particled *dispersion*, it may be desirable to subject the *dispersion* to a conventional agglomerating procedure as, in general, coarse-particled *emulsions* are preferred to fine-particled *emulsions*. The particle size of the *emulsion* is another factor which will be taken into account on an empirical basis when formulating a drilling fluid for a particular use. If the polymer is available in the form of a dry powder, it may be converted into a *dispersion* either using water or part or all of the drilling fluid.

To use the *polymer dispersion* in an oil-based drilling fluid, *it is necessary to disperse it in the oil, and for this purpose an emulsifier is necessary*. Polymer dispersions will normally contain an *emulsifier* added to the preparation of the polymers or subsequently to *stabilise* them, and the drilling fluid will also normally contain a *surfactant* but it is normally necessary to add additional oil-soluble *surfactant* to *disperse the polymer dispersion* in the oil or oil-based fluid. [Emphasis added.]

In contrast, the invention as recited in the amended claims is based precipitation as evidenced by the preferential accumulation of latex into the crack throats. The recited aluminum complexes enable *precipitation*, rather than continued and constant dispersion. The use of an emulsifier and/or a surfactant is not necessary in the claimed invention. For all of these reasons it is respectfully submitted that the invention as recited in the amended claims is not taught by the reference.

Reconsideration is respectfully requested.

Rejection Under 35 U.S.C. §102(b) Over Griffith, et al.

The Examiner has rejected claims 1-5, 7-9, 11, 12, 14-18, 20-28, 30, 31, and 33-37 under 35 U.S.C. §102(b) as allegedly being anticipated by the U.S. Pat. No. 6,401,817 to Griffith, et al.

The Examiner finds that Griffith, et al. teach a drilling fluid, for drilling a well-bore, which comprises a latex, such as isoprene, water, sodium carbonate salt, a surfactant and bentonite which is an aluminosilicate, which are allegedly the same as the precipitating agent of the present invention (referring to examples, column 5, lines 3-20, column 4, lines 11-24 and claims). The Examiner further contends that although Griffith, et al. do not specifically state that the clay is a precipitating agent, the mere reason for adding a material to another is not a patentable difference, once more citing *In re Lintner* and *In re Mod*. Thus, the Examiner concludes that the present invention is allegedly anticipated by Griffith, et al.

The Applicants must respectfully traverse.

A patent claim is anticipated only when a single prior art reference discloses each and every limitation of the claim. *Glaxo Inc. v. Novopharm Ltd.*, *id*.

The Examiner's attention is again respectfully directed to the amendments to the rejected independent claims herein 1, 8, 20, 24, and 27 where all claims have been amended to include at least one precipitating agent where the precipitating agent is selected from the group consisting of aluminum complexes. It is respectfully submitted that Griffith, et al. do not teach or suggest the use of the recited aluminum complexes as precipitating agents, and thus the single prior art reference does not disclose each and every limitation of the claims, as amended.

It is further respectfully submitted that the important technical and commercial distinction between the GB 2351986 and the GB 2131067 references and invention as recited in the amended claims is also present between the claims and Griffith, et al. Griffith, et al. concerns improved compositions and methods of using the compositions for sealing subterranean zones where one composition of the invention is comprised of water, an aqueous rubber latex, an organophilic clay, sodium carbonate, an epoxy resin and a hardening agent for said epoxy resin (please see the Abstract). While the Applicants do not wish the claims to be limited by any of the details of a mechanism described in the previous arguments, an important point is that the *aluminum complexes* are recited as *precipitating agents* and Griffith, et al. do not teach or describe any precipitating agents, much less precipitating agents that are aluminum complexes, as required.


While bentonite clay is mentioned as preferred in line 4 of column 5, there is no teaching or description of bentonite clay operating as a precipitating agent in the compositions and methods of Griffith, et al. at all. Furthermore, Griffith, et al. consistently and repeatedly teach throughout their patent the necessity of an epoxy resin and a hardening agent for the epoxy resin, neither of which are necessary or desired in the claimed fluids and methods.

In contrast, the invention as recited in the amended claims is based on precipitation, as recited, as demonstrated by the preferential accumulation of precipitating agent *and* latex into the crack throats, rather than by using a hardened epoxy resin. It is difficult to imagine how hardened epoxy resin is to be removed from deep within a well bore, if necessary. For all of these reasons it is respectfully submitted that the invention as recited in the amended claims is not taught by the reference.

Reconsideration is respectfully requested.

It is respectfully submitted that the amendments and arguments presented above place the claims in condition for allowance. Consideration and allowance of the claims, as amended, are respectfully requested. The Examiner is respectfully reminded of his duty to indicate allowable subject matter. The Examiner is invited to call the Applicants' attorney at the number below for any reason, especially any reason that may help advance the prosecution.

Respectfully submitted,
CALVIN JOSEPH STOWE, II, et al.,



David L. Mossman
Registration No. 29,570
Attorney for Applicants
Telephone No. 512/219-4026
Facsimile No. 512/219-4036

Madan, Mossman & Sriram, P.C.
2603 Augusta, Suite 700
Houston, TX 77057-5638